

CH-2

Acids, Bases & Salts

Acids are :-

- Sour in taste
- Change Blue litmus paper into red.
- Release H^+ ion when dissolved in water.
- React with metal, release hydrogen gas.

Base are :-

- Bitter in taste
- change red litmus to blue
- Release OH^- when dissolved in water.

Indicators :-

The substances which identify other acid-base they are of basically of two types.

- Natural
- Synthetic.

Natural Indicators :-

The indicator which are naturally obtained from plants or any other source.

Ex:- litmus paper, turmeric, red cabbage leaves

For Acid :-

- there is no change in of colour in turmeric.
- Blue litmus into red.

For Bases :-

- turmeric changes into reddish-brown
- Red litmus changes into blue.

Synthetic Indicators :- The indicators obtained from minerals like phenolphthalein and methyorange.

For Acid :-

- Phenolphthalein remain colourless.
- Methyorange changes to pink.

For Bases :-

- phenolphthalein changes to pink
- methyorange changes to yellow.

Theoretical method for testing Acid or Base.

For Acid :- When a compound dissolves in water release H^+ ion are called acid.

For Ex :- HCl , HCN

For Bases :- When a compound dissolves in water release OH^- ion are called Base.

For Ex :- $NaOH$, $Mg(OH)_2$, KOH , $Ca(OH)_2$

Strong Acid :- The compound which have more H ion concentration are known as strong Acid.

For Ex :- HCl , H_2SO_4 , HNO_3 , H_3PO_4

Weak Acid :- The compound which have less no. of H ion concentration are called weak Acid.

For Ex :- HCN , CH_3COOH , so on

Strong Base :- The compound which have more OH ion concentration are known as strong base.

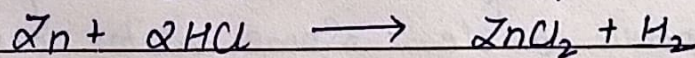
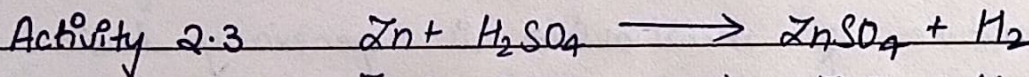
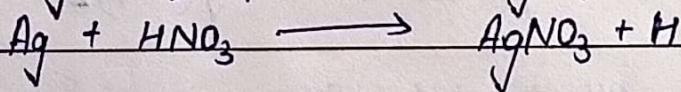
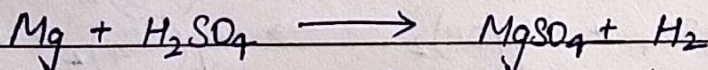
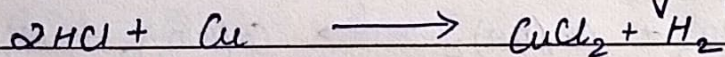
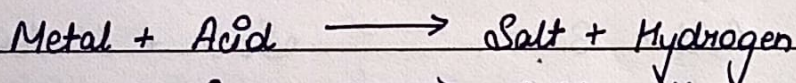
For Eg :- NaOH , KOH , $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$

Weak Base :- The compound which have less OH ions concentration are known as weak base.

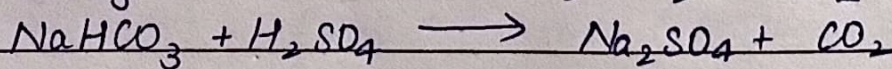
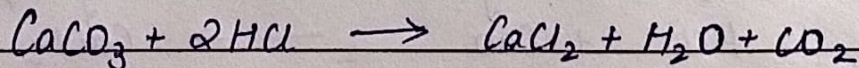
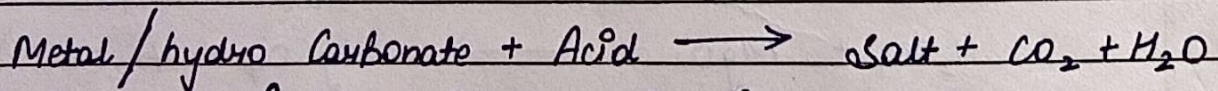
For Eg :- NH_3 , CH_3OH

Chemical property of Acid

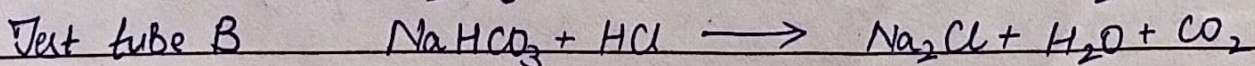
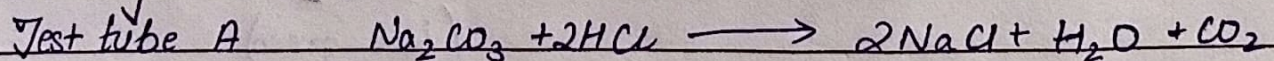
- Metals react with acid. When metal reacts with acid to form salt & hydrogen gas.



- Acid react with metal Carbonate or hydro carbonate [hydro carbonate].

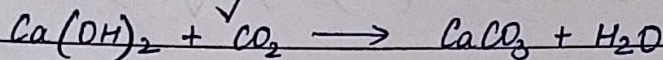


Activity 2.5

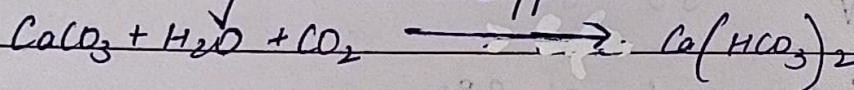


Important Note :-

- When CO_2 pass through lime water $[\text{Ca}(\text{OH})_2]$ the colour it becomes milky

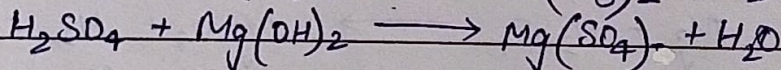
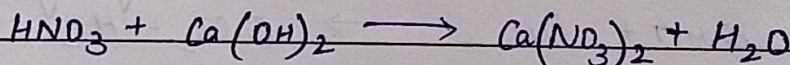
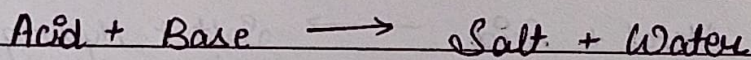


- When ~~across~~ excess amount of CO_2 pass through lime water the milky colour disappear.



- Neutralization reaction

When acid reacts with base it forms salt and water.

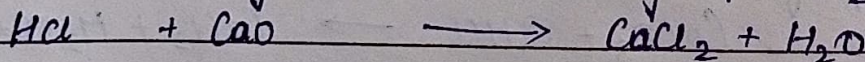
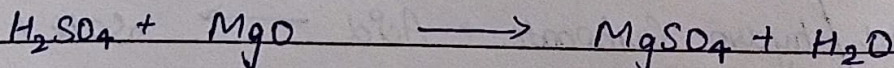
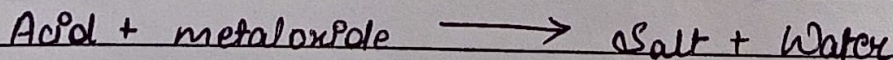


- Acid reacts with metal oxide

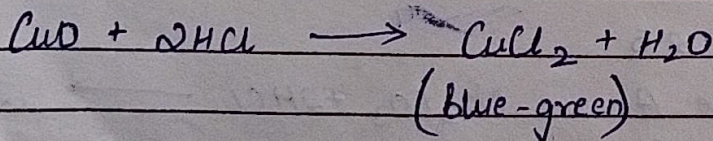
The nature of metal oxide is generally basic.

Amphoteric oxide :- Some metal oxide are of both nature.

Ex:- Al_2O_3 & ZnO

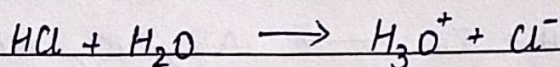


Activity 2.7



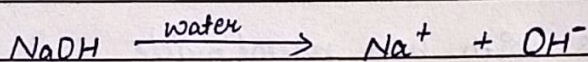
◦ Acid react with water

When Acid react with water it forms hydronium ion H_3O^+ and conduct electricity.



◦ Base react with water

When base react with water it forms its corresponding ions.



Acid conducts electricity

The distilled water do not conduct electricity because it don't have ions.

When Acid dissolve in distilled water like HCl , HNO_3 , H_2SO_4 , H_3PO_4 .

Activity 2.8 :-

(for reading)

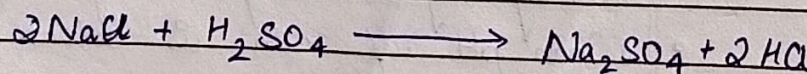
Base conducts electricity

Base dissolve in water forms ions and conduct the electricity but ethanol, sugarcane do not conduct electricity.

Exception (Acid)

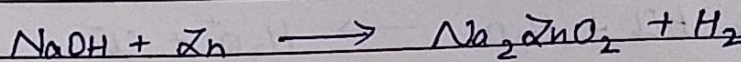
Glucose ($C_6H_{12}O_6$), Ethanoic acid (hydrocarbon based acid) do not conduct electricity because they don't form ions.

Activity 2.9 :-



Chemical properties of Base

- Some Base reacts with metal from salt and hydrogen gas.

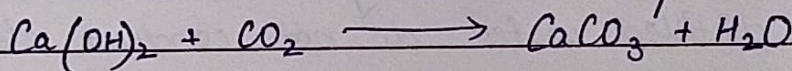


- Neutralisation reaction

When Base reacts with Acid it forms Salt and Water.

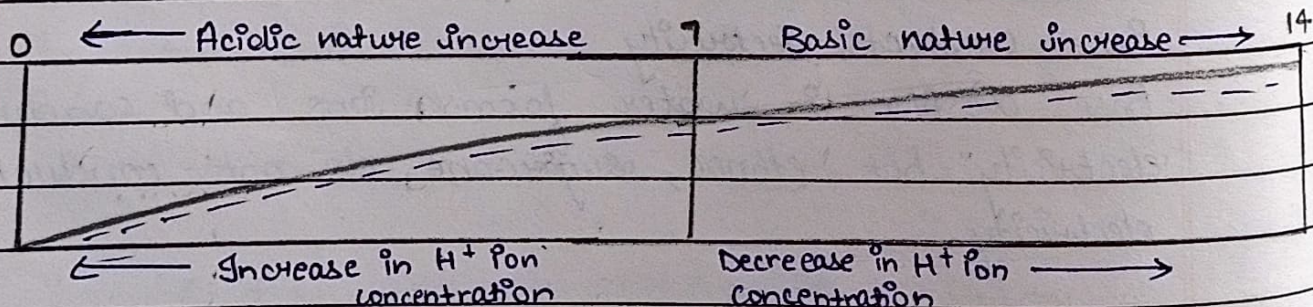
- Base reacts with non metal oxide

The nature non-metal oxide is generally Acidic. When they react neutralisation reaction takes place.



pH scale :- The measurement of strength of Acid or Base using pH value. $pH = -\log$.

$$pH = -\log$$



pH of soil

- The growth of plant required generally pH between 6.5 to 7.5.
- Living organism's pH range is 7.0 to 7.8.
- When pH of rain is below 5.6 then it is called acid rain.

- pH in our digestive system.

Our stomach produces HCl. It helps in digestion of food without harming the stomach. During indigestion the stomach produces too much acid and this causes pain and irritation. To get rid of this pain people use bases called antacids.

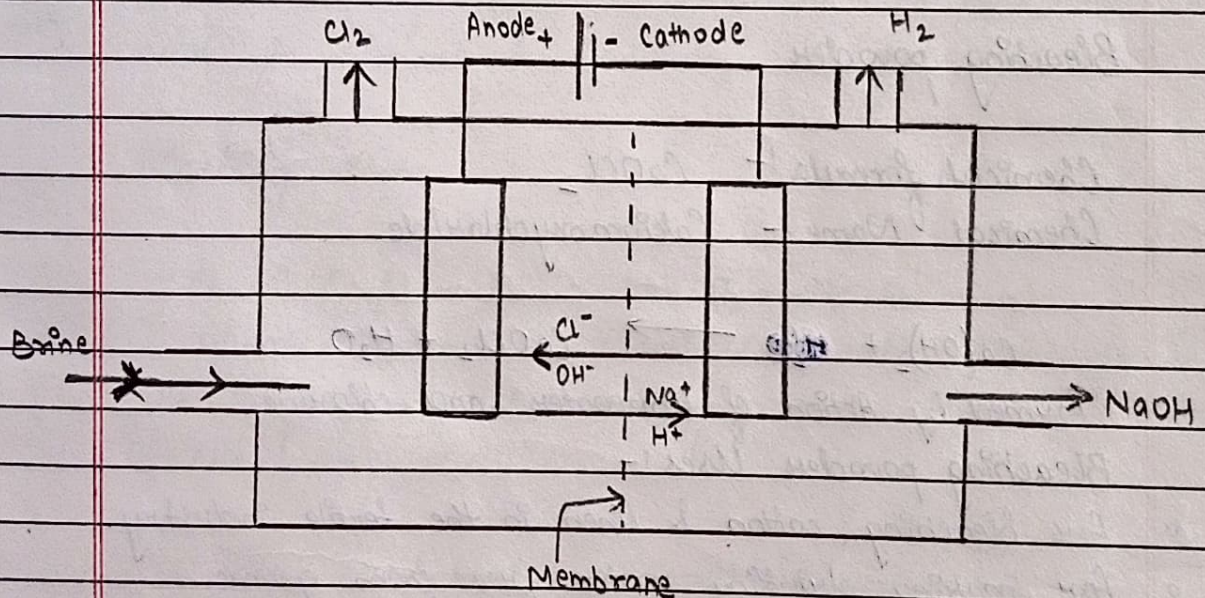
Chemical from Common salt

Caustic Soda

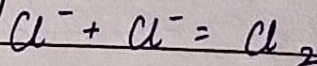
Chemical Name Sodium hydroxide

Chemical formula NaOH

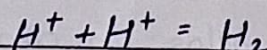
Manufacturing



The Caustic soda prepared by electrolysis process in this process brine (NaCl) pass in electrolytic solution, water, brine breakdown into two parts Na^+ , Cl^- . At anode Cl gain the electrode form Cl gas.



At Cathode



In this solution Na^+ , OH^- join to form Caustic soda. This process is also known as chlor Alkaline process.

Uses of Cl_2

Use for water treatment, swimming pools, CFCs, PVC.

Use of H_2

Fuels, ammonia (NH_3)

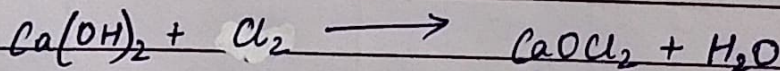
Use of Caustic soda :-

Soaps, detergents, paper making.

Bleaching powder

Chemical formula :- $CaOCl_2$

Chemical Name :- Calcium oxychloride



Formed by Action of limewater and chlorine.

Bleaching powder Uses :-

- For bleaching cotton & linen in the textile industry.
- For making drinking water free from germs.
- It also act as a oxidising agent in many industries.

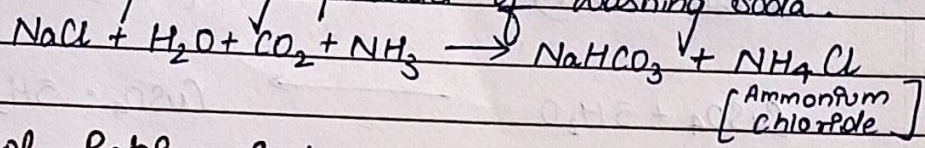
Baking soda

Chemical formula :- NaHCO_3

Chemical Name :- Sodium hydrogencarbonate.

Manufacture It is manufactured by Solway process which includes raw materials NaCl , H_2O , CO_2 , NH_3 .

It is the primary product of washing soda.



Uses of Baking Soda

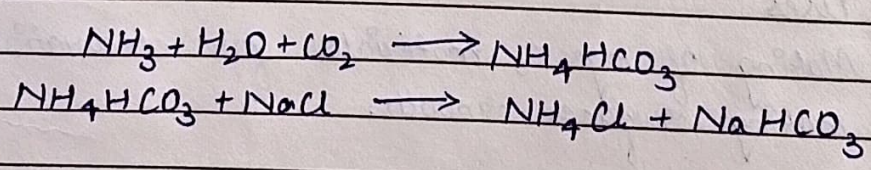
- It is commonly used in kitchen for making pakoras, etc.
- It is also used in soda-acid fire extinguisher.
- It is a ingredient in antacids, it neutralises excess acid in stomach & provides relief.

Washing Soda

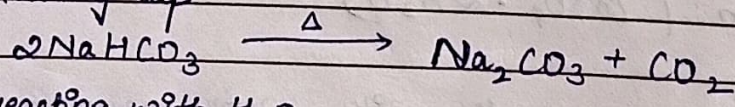
Chemical formula :- $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

Chemical Name :- Sodium Carbonate decahydrate.

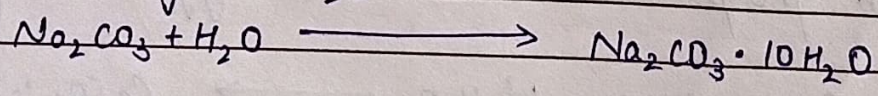
It is prepared by solvay process the raw materials NH_3 , NaCl , H_2O , CO_2



By heating up



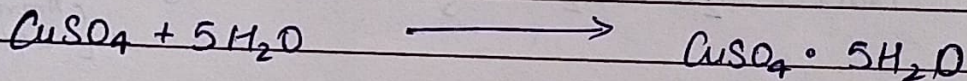
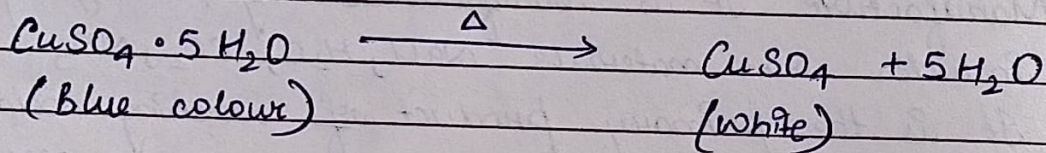
On reacting with H_2O



Uses of washing soda

- Use to remove permanent hardness of water.
- Used in glass, soap and paper industries.

Activity 2.15



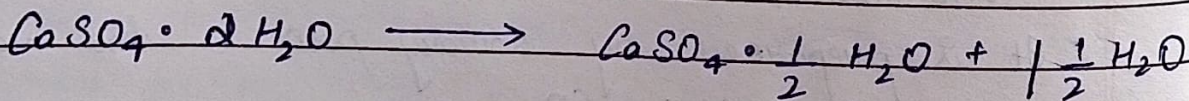
Crystallisation of water

It is the fixed no. of ^{water} molecules present in one formula unit of salt.

P.O.P (Plaster of Paris)

When gypsum is heated $\text{at } 373\text{ K}$ it convert into plaster of paris.

Chemical formula :- $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$

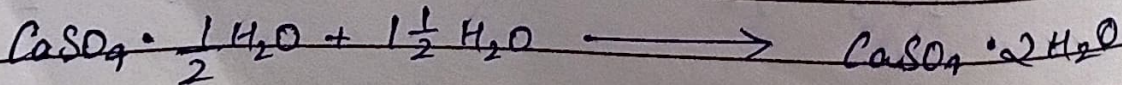


Uses

Making of toys, materials for decoration & for making surfaces smooth.

Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)

When p.o.p reacts with water, gypsum is formed.



Bleaching powder	CaOCl_2	Calcium oxychloride
Baking soda	NaHCO_3	Sodium hydrogencarbonate
Washing soda	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$	Sodium Carbonate deca hydrate
P.O.P	$\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$	Calcium Sulphate Hemi hydrate.

- Olfactory indicators :- There are some substances whose colour change in basic and acidic medium.
Ex :- Vanilla, onion, clove.
- The separation of H^+ ion from HCl molecules cannot occur in the absence of water.
- The process of dissolving an acid or base in water is highly exothermic one.
- Mixing an acid or base with water results in decrease in concentration of ions (H^+/OH^-) per unit volume known as dilution.
- Our tooth is made up of calcium hydroxyapatite.